

Ch. 1

(some) dimensions and units

fundamental	<u>Dimensions</u>	<u>units</u>
	time	<u>seconds</u> , min., hours, ..
	mass	grams, <u>kg</u> , ...
	length	ft., in., <u>meters</u> , ...
	abstract	specific

<u>Dimensions</u>	<u>units</u>
speed	mph, <u>m/s</u> , <u>mi/s</u>
(surface) area	in ² , ft ² , <u>m²</u>
volume	in ³ , ft ³ , <u>m³</u>
⋮	⋮

Unit conversion

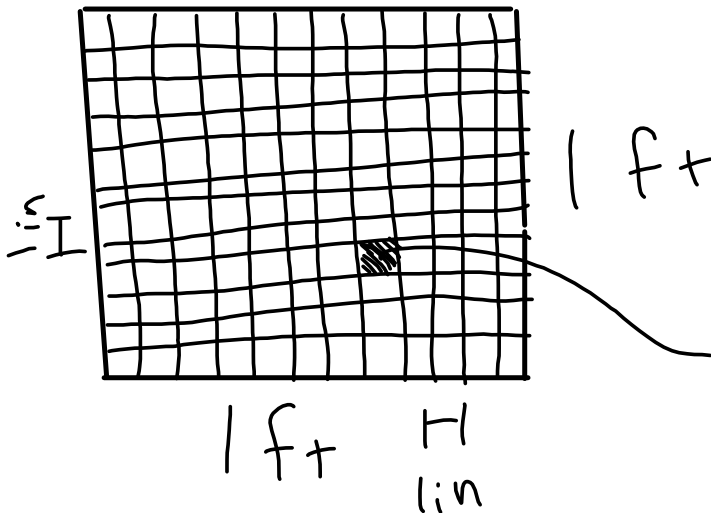
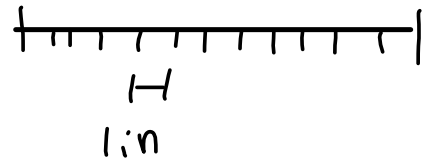
$$1 \text{ yr} = 365 \text{ days}$$

$$1 \text{ day} = 24 \text{ hours}$$

$$1 \text{ ft.} = 12 \text{ inches}$$

~~$$1 = 365$$~~

$$1 \text{ ft}$$



$$\text{AREA} = 1 \text{ ft}^2$$

~~$$1 \text{ ft}^2 = 12 \text{ in}^2$$~~

$$1 \text{ ft}^2 = 144 \text{ in}^2$$

Example convert 3 kg/m^3

to g/cm^3 .

trick: multiply by 1

$$\left(\frac{3 \cancel{\text{kg}}}{\cancel{\text{m}^3}} \right) \underbrace{\left(\frac{1000 \text{ g}}{1 \cancel{\text{kg}}} \right)}_1 \underbrace{\left(\frac{1 \cancel{\text{m}}}{100 \text{ cm}} \right)}_1 \underbrace{\left(\frac{1 \cancel{\text{m}}}{100 \text{ cm}} \right)}_1 \underbrace{\left(\frac{1 \cancel{\text{m}}}{100 \text{ cm}} \right)}_1$$

$$= \frac{(3)(\cancel{1000} \text{ g})}{(\cancel{100} \text{ cm})(\cancel{100} \text{ cm})(100 \text{ cm})} = \frac{3 \text{ g}}{1000 \text{ cm}^3} = \boxed{0.003 \text{ g/cm}^3}$$

Dimensional analysis (aka dimensions must make sense)

How many inches in an hour? - Doesn't make sense!

Ex: Given $F_g = G \frac{m_1 m_2}{R^2}$

and $[Force] = \frac{kg \cdot m}{s^2}$.

What is $[G]$?

$$[G] = \frac{m^3}{kg \cdot s^2}$$